APPENDIX - IV

MAHARSHI DAYANAND SARASWATI UNIVERSITY,

AJMER

Format for Outline of Proposed Research work

1. Name of Scholar (In English) Vaibhav Saraswat
   (In Hindi) वैभव सारस्वत
2. Title of the Research Work
   (in English) **STUDY OF EFFECT OF GYPSUM MINING ON FEW SELECTED AGRICULTURAL CROPS OF NAGAUR DISTRICT**
   (In Hindi) **नागौर जिले के कुछ चयनित कृषिक फसलों पर जिप्सम खनन के प्रभाव का अध्ययन**
3. Location
   a. Institution/Department where the work is to be done
      Samrat Prithviraj chouhan government College, Ajmer
   b. Geographical area of investigation, if any.
      Selected Gypsum mines in Nagaur District
4. Introduction Importance of Proposed Investigation, Objectives.
5. Review (Work already done on the subject of proposed Research Study.
6. Research Gaps identified in the proposed field of investigation. (Based on the review)
7. Major Hypothesis, if any.
8. Research Methodology.
9. List of References cited.

14/9/16

Signature of the Candidate with date

Outline Approved.

Name and Signature of supervisor with date & seal.

14/9/2016

Lecturer

Samrat Prithviraj Chauhan

Govt. College, Ajmer

STUDY OF EFFECT OF GYPSUM MINING ON FEW SELECTED AGRICULTURAL CROPS OF NAGAUR DISTRICT

नागौर जिले के कुछ चयनित कृषिक फसलों पर जिप्सम खनन के प्रभाव का अध्ययन

A

SYNOPSIS

Submitted for the registration for Doctor of Philosophy

To

MAHARSHI DAYANAND SARASWATI UNIVERSITY, AJMER

In the faculty of Science (Botany)

2016

Supervisor

Dr. Manoj Kumar (M.Sc., Ph. D)
Lecturer in Botany,
Department of Botany,
Samrat Prithviraj Chouhan
Government College, Ajmer

Submitted by

Vaibhav Saraswat
Ph. D Scholar,
Department of Botany,
Samrat Prithviraj Chouhan
Government College, Ajmer

MAHARSHI DAYANAND SARASWATI UNIVERSITY,

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Format For Outline of Proposed Research Work

INTRODUCTION

Mining is the extraction of valuable minerals or other geological materials from the earth. Mining is important because minerals are major sources of energy as well as materials such as fertilizers and steel. Mining is essentially a destructive developmental activity, where ecology suffers at the alter of economy. Mining has been identified as one of the major environment impact on the ecosystem. The mining activity impact flora and fauna, changes in soil profile, ph, conductivity, humidity, water pollution, air pollution, soil pollution, dust impact, blasting impact and land impact, loss in soil fertility etc. Are some major impacts in mining area (A. Vyas and A. Pancholi, 2009).

Rajasthan is pre-eminent state in quarrying and mining gypsum in India. Nagaur is one of the 33 districts of the state of Rajasthan in western India. Area of the district is 17,718 km^2. The city of Nagaur is the district headquarter. Nagaur district is situated between 26°25' & 27°40 North latitude and 73°10' & 75°15' East longitude. The district is bounded by 7 districts namely Bikaner, Sikar, Churu, Jaipur, Jodhpur, Pali and Ajmer. There are 11 blocks in the district. The district lies in the marwar region of Rajasthan in the north western thorn scrub forests belt surrounding the Thar desert. The Aravalli range extends across the south eastern portion of the district and the saline sambhar lake,

Nagaur district is abound with variety of mineral resource tungsten, lignite, gypsum, limestone and marble are the most important mineral found in the district. Mining is source of employment to more than 1.50 lakh people directly or indirectly in district. Nagaur is very rich in gypsum deposit. Nagaur Bhadwasi, Makodi, Manjhwas, Pilanwasi, Ganthilasar and Bhadana and manglod are in particular.it is a non forest area.the reserves of gypsum in Nagaur district were estimated to be 952 million tones with 81% content and above by the geographical survey of India. Substantial part of the gypsum produced here has been supplied to the Sindri fertilizer factory in Bihar. It has also found its way to Haryana, after primary grinding.

Gypsum is a soft sulfate mineral composed of calcium sulfate dehydrate with the chemical formula caso4.2H2O.It is a rock like mineral commonly found in the earth's crust. It is a sedimentary mineral which is found in layers. Gypsum is widely mined and is used in the building industry and used to make plaster of parish and as a fertilizer. Gypsum is the source

of calcium and sulfur for plant nutrition, it improves acid soils and treats aluminum toxicity and improves water filteration.

Van alphen and de los rios romero (1971) conclude that up to 2 % gypsum in the soil favours plant growth. From intensive field observation of gypsiferous soils in Iraq, Smith and Robertson (1962) found that root growth was inhibited where the gypsum content of soil was over 10% .It also helps to reduce run off and erosion. Gypsum is an excellent kick starter, gains in crop production and longer term improvement in soil structure. Soil gypsum affect the mineral content of plants, Hernando et al. (1965). Although gypsum application to acid soils have generally resulted in positive crop growth responses. Some studies have shown either no response or even negative responses (Alva and Sumner, 1990)

In this research work, the effect of gypsum mining on two agricultural crops Millet/Bajra (Pennisetum typhoides*)* And mung bean (Vigna radiata) will be studied. Both crops are mostly grown in the gypsum mining area. Mung (Vigna radiata) is a plant of leguminosae family. It is a pulse crop in India also known as green gram. It is rich in digestible protein. Mung beans are small green legume with a high source of protein fiber and phytonutrient. They are warm season annuals, highly branched and having trifoliate leaves. Both upright and wine types of growth habit occur in mung with plant varying from 1ft to 5ft. It performs best on soil with a pH between 6.2 and 7.2. *Pennisetum typhoides* (Bajra) is a member of poaceae family. It is a food crop and major source of food and fodder for villagers of this region. It is well adopted to growing areas like Nagaur which is characterized by drought, low soil ph. Bajra is rich in protein fat, minerals, fibers, calcium, carbohydrate and phosphorus. The tolerance, yield and product qualities of *Pennisetum typhoides* and *Vigna radiata* are not yet well known in the mining area of gypsum.

During the research work, the morphological, anatomical, physiological and phytochemical study of the millet and green gram will be done to know the changes due to effect of mining gypsum. Lab experiments will be conduct in laboratory of department of botany, government college Ajmer. Along with this, the soil ph, fertility, humidity, will also be test to know the gypsum mining effect on abiotic factors.

The present observation will be done under the supervision of Dr. Manoj Kumar Yadav, department of botany, government college, Ajmer to observe the mining effect of gypsum on *Pennisetum typhoides* and *Vigna radiata* in Nagaur district.

OBJECTIVES:-

- To study that how the effect of gypsum mining arise and how it effect the *Pennisetum typhoides* and *Vigna radiata*
- The aim of the proposed research is to analysis the change in crop productivity near gypsum mining area.
- The main objective of the present study is to study the morphological, physiological, anatomical, and phytochemical changes due to mining in *Pennisetum typhoides* and *Vigna radiate*.
- To assess the current status of gypsum mining effect on plants
- To study the effect of gypsum dust on leaves and transpiration rate of both plant and ears of *Pennisetum typhoidus* and seed of *Vigna radiata.*
- To prepare a graphical analysis of interaction between gypsum mining and crop yield.
- The purpose of this study is to educate and aware people that how gypsum mining can effect crop production.
- To Study the tolerance for gypsum in selected agriculture crops.
- Quantitative and qualitative analysis of seed of *Pennisetum typhoides* and seed of *Vigna radiata* will be done.
- Quantity test of calcium and sulfur will be done of selected crops sample of mining area.

Importance of proposed research work

- The proposed study will reveal the effect of gypsum mining on agricultural crop productivity.
- This research work will reveal a short term and long term effect of gypsum mining on agriculture crops.
- A graphical study can be done to know the effect of mining of gypsum on crop productivity.
- This research work will explore the morphological, anatomical, physiological and phytochemical changes in *Pennisetum typhoides* and *Vigna radiate* in gypsum mining area.
- Data collection and analysis of this study will be helpful in further assessment and statistical study.
- The recommendation of this study will help in future for determine the mining limit of gypsum for positive growth of crops.
- The proposed study will suggest waste material management of gypsum near the mining area.

REVIEW OF LITERATURE

Mining of natural resources is one of the major cause which directly or indirectly effect the biotic and abiotic factors of ecosystem. In recent years a large number of publications dealing with environmental impact of mining. The notable contributions are those of S. Verma and K. C. Sharma (2009), S. Bhandari and A. Bhandari (2004), V. Sheoran (2010), A. Pancholi (2009), J.V Natani (2003) and C.P Gaur (2007) etc.

Mining has been identified as one of the major environmental impact on forests worldwide. The ecological footprint of mining activity extends beyond the area directly impacted (Lee Frelich,2014).

Mining is essentially a destructive developmental activity where ecology suffers at the alter of economy. Hence mining operations necessarily involve deforestation, habitat destruction, biodiversity erosion and destruction of geological records. (R.K. Sinha, 2000).

A. Shyam Kumar, K. V. Reddy, and M. Ashok (2014) studied on Tulasi (osmium sanctum) and identify the variation in morphology through different methods of gypsum application

The flora and fauna and ecology are being impacted by mining activity, the flora or Rajasthan was extensively been worked out by Bhandara (1978, 1990). Nair and Joshi (1955) have studied ecology and plant association of Rajasthan flora. Most of their publication have been reviewed by Sarup and Bhandari (1957)

S. D. Jarwal, R. D. Armstrong and P. Rangasamy have done intensive work on effect of gypsum and stubble retention on crop productivity in western Victoria S. K. Manju and K. Saha studied on mining industry on environmental fabric: A case study of Rajasthan state in India. A. Vyas and A. Pancholi studied environmental degradation due to mining in south Rajasthan: A case study of Nimbahera. S Bhandari intensively studied of mining in western Rajasthan (1986) . V. Agarwal also studied on mining and environment in Rajasthan mining (1984).

Van Alphen and de los Rios Romero (1971) conclude that up to 2 % gypsum in the soil favours plant growth. From intensive field observation of gypsiferous soils in Iraq, Smith and

Robertson (1962) found that root growth was inhibited where the gypsum content of soil was over 10%. Kovda (1954) and other workers observe that plant root do not penetrate a soil layer containing 25% of gypsum or more. Boyadgiev (1974) also noted that crops such as alfalfa could grow very well and give high yields even in soils containing up to 50% of powdery gypsum. M. Toma, M. E. Sumner. G. Weeks, and M. Saigusa worked on long-term of gypsum on crop yield and subsoil chemical properties. Mardoud (1980) observes that pines root can not penetrate a soil layer with 605 of gypsum.

J. V Natani studied on geological and environmental status of Makrana marble mining area and strategy for sustainable development. Unmechanical mining on small lease holds and blasting result in high waste generation and resources wastage in the area (J.V, Natani)

The most remarkable work on the plant of Indian Desert was published by Blatter & Hallberg (1918-21). Desert ecosystem in India have been discussed by T.S Chouhan and UK Sharma in Tropical biology and conservation management. Ishwar prakash and R.K. Gupta (1975) also They published impact of mining in Rajasthan and ecofriendly technology for sustainable development (2002)

Ryding (1978) found in greenhouse trials, that application of gypsum decreased the yield of flue-cured tobacco although the Ca content of leaves was increased. Soil gypsum affect the mineral content of plants, Hernando et al. (1965). Although gypsum application to acid soils have generally resulted in positive crop growth responses. Some studies have shown either no response or even negative responses (Alva and Sumner, 1990.

S. Bhandari presented his work on environment and mining in western Rajasthan entitled “Environmental degradation in western Rajasthan” (1987). S. M. Manohar, L.S, Rajpurohit and Arun Shrivastava also conducted an intensive study on “stone mining and environmental hazards around jodhpur” (1987). Sushil Bhandari very deeply worked on blasting impact on environment. Bhandari published “Managing social and environmental issue due to blasting operation” with Sheetal Jain. they revealed the hazard of mining and along with this suggested advanced tools and techniques, blast design software and blast management plan.

The conflict between mining activity and its external environment has been intensified in the recent years as mining has led to the destruction of the resources. (Praveen Lodha: Environment Impact Assessment). In 1988, innumerable studies were conducted mainly either

on the environmental aspect of a particular area or of a particular mineral. The work worth mentioning of these are: Mining and environment (S.C Patnaik and S. Roy). mining and ecological impacts of Himalayas (S.P Baloni and Raj Tilak). In Rajasthan P.S Rajawat and A. bhargava published "The environment and management to mining operation in Rajasthan with special reference to air and water pollution.

Dr. K.C Sharma is well known ecologist of Rajasthan. He did a lot of work and studied ecology of Rajasthan. Mining environment, restoration of degraded lands, phytoremediation. He studied "physio-chmeical characterstics and fluoride distribution in ground water of Gotan area in Nagaur, Rajasthan.

Degradation of land disturbs the ecosystem balance by destroying the species diversity. (J. Venkateswarlu, 2012). Francis cottard illustrated a short review on potential environment impacts of mining and socio economic impacts of public safety.

S. S. Chouhan studied Bijolia mining area in Rajasthan "(Mining development and environment: A case study of Bijolia mining area in Rajasthan)". Lignite deposits of Bikaner-Nagaur basin around Matasukh- Kasnau in Nagaur districts was studied by A. Vyas, G. S. Mittal and C.P Gaur (2015). The eco system of Indian desert are governed by location temperature and climatic conditions where land forms have their distinctive role (T. S. Chouhan and Sharma).

The ground water is characterized by multiple quality pollutants, viz. coloured dyes, heavy metal nitrates and fluoride etc. the water is universal solvent which contain many dissolved substances. The preliminary study carried out in the present investigation indicates that Nagaur region contains high fluoride contamination in ground water due to its rich structure. (Rana T.S Ratnu, Bharat, Bamel Kiran)

Conventional and unscientific mining poses severe threat to life, public property and continuation of mining in the area, incompatible land uses, huge waste dumps and large scale land transformation have resulted in land degradation, ponding, flooding, water contamination and health hazards in Makrana mining area (J. V. Natani, K.S. Raghav (2003)

Wildlife species living within the primary mining footprint would be directly displaced, due to loss of forest and other vegetation (Van Wilgenburg et al, 2013). Wildlife corridors that cross the primary footprint of mining could be disrupted. (Burdett et al. 2007)

Numerous points of introduction will occur due to exploration and mining at the landscape scale, since human disturbances such as clearing vegetation and road building are well known to introduce invasive species (Hansen and Clevenger. 2005, Cameron et al. 2007). Microtopography can be enhanced artificially, speeding up the recovery process after mining such as by adding woody debris (Brown and Naeth 2014)

An unspoiled nature can provide ecological security to people but cannot bring economic prosperity scientific mining operation accompanied by ecological restoration and regeneration of mined wastelands and judicious use of geological resources with search for eco-friendly substitutes and alternatives must provide the answer (R. K Sinha, D. K. Pandey, A. K. Sinha, 2000)

Thus, the study of literature reveals that a lot of work has been done on the different aspect of the mining effect on flora as a whole but no comprehensive work at the district level with the special reference of *effect of gypsum on agricultural crops* of that area has been done so far. Therefore, in the present investigation study of ***effect of gypsum mining on few selected agricultural* crops *of Nagaur*** will be worked out.

MAJOR HYPOTHESIS

Mining and agriculture, both are very different area. But both are interrelated in the end. An analysis of mining activity can be done for the assessment of impact on plants. Mostly it is considered that mining is only a destructive activity with a negative effect on every biotic factor. Gypsum is a soft sulfate mineral composed of calcium sulfate dehydrate with the chemical formula CaSo4.2H2O. It is a rock like mineral commonly found in the earth's crust. it is a sedimentary mineral which is found in layers

Nowadays, the gypsum mining activities are increasing rapidly in Rajasthan to grow up the economy very fastly. Although gypsum application to acid soils have generally resulted in positive crop growth responses. Some studies have shown either no response or even negative responses (Alva and Sumner, 1990) The proposed study is mainly based on the effect of gypsum mining on agricultural crops. This effect can be direct or indirect, positive or negative, The proposed study will reveal pure analysis of mining activities and their current status. The result of this study will be useful in determining interrelation between quantity of mined gypsum and morphology, anatomy, and physiology of selected crops samples. It will be represented by a graphical analysis of interrelation between gypsum mining and crop yield.

Data collection and analysis of this study will be helpful in further assessment and statistical study. The main objective of the present study is to study the morphological, physiological, anatomical, and phytochemical changes due to mining in *Vigna radiata and Pennisetum typhoides*. This research work will reveal a short term and long-term effect of gypsum mining on agriculture crops Quantitative and qualitative analysis of seed of *Pennisetum typhoides* and seed of *Vigna radiata* will be done. quantity test of calcium and sulfurr will be done of selected crops sample of mining area.

Research gaps identified in the proposed investigation (Based on review)

Research gaps is the scope area and possibilities for new discoveries, investigations or explore something new in the proposed field.

After review of the various literatures related to this topic. We find that a few observation and research has been done in mining effect on agricultural crops in Nagaur. But any interdisciplinary research has never been conducted so far in the Nagaur district to know the mining effect on gypsum on any specific agricultural crop which is mostly found in this area.

Due to its distinct physiography, the geologists have studied the geological aspects, economists have been studying the economic aspects of the minerals. The geographers have studied the distribution and production of minerals and mines location.

Nowadays, the gypsum mining activities are increasing rapidly in Nagaur. Such types of mining activities are taking place near the non forest and agricultural land. The dust and suspending particles of gypsum are changing climatic condition and mixing up with soil and water. It is demand of present situation to deep study and analysis of the interrelation between the gypsum mining and crops morphology and physiology.

So there is enough scope to find out current status and effect of mining of gypsum on *Vigna radiata* and *Pennisetum typhoides* in Nagaur and along with this study will show which mining activity impact negative and positive to crops growth.

Research methodology

The study of proposed research work is mainly based on field work. Nagaur is very rich region in gypsum mineral on account of availability of limited time, resources and data. The study of whole Nagaur district's gypsum mining area is not so easy. So the selected mining areas will use for study with the following schedule –

First step (time period – three months)

- Frequently survey of whole gypsum mining areas in Nagaur district
- Important literature collection related to research work.

Second step (time period - 6 months)

- The mining areas and agriculture areas near it will be selected for research work.
- The select mining areas will be visited three times in a week.
- Sample of soil and selected plants will be collected.
- Lab experiment will be done with collected samples.

Third step (time period – six months)

- Selected mining areas will be visited once again and samples will be taken for confirmative test.
- Lab experiment will be conduct for final result.

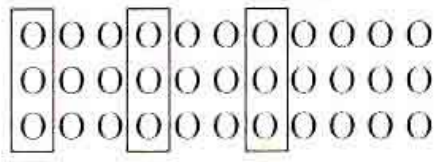
Fourth step (time period – six months)

- All data, which was collected during the research work will be studied analytically, statistically, and comprehensively.
- Final report will be prepared on the basis of all above research plan.

N = population size

n = sample size

Using this procedure each element in the population has a known and equal probability of selection. At least two elements adjacent to each other will never be chosen by systematic sampling.



3. **Experimental method**:-

For the study of phytochemical analysis of biotic factors, this method will be used. It is a systematic and scientific approach to research in which the researcher manipulates one or more variables and controls and measures any change in other variables. This method will be used in selected mining areas and the primary data will be collected during use of this method, one effect at a time will be selected the following experimental method will be used in laboratory –

i) The phytochemical investigation of a plant involved in the following.
ii) Extraction of plant material.
iii) Identification of the Phytoconstituents.
iv) Separation and isolation of Phytoconstituents.
v) Characterization of the isolated compounds.

Phytochemical screening: Phytochemical examinations were carried out for all the extracts as per the standard methods.

Aqueous Extract:- The marc remains after extraction was dried and then it is extracted with 2-3 liters of chloroform water (0.25 %) using soxhlet apparatus by continuous hot percolation method, after extraction it was filtered and the removal of solvent was done under reduced pressure by distillation process.

Detection of carbohydrates: Extracts were dissolved individually in 5 ml distilled water and filtered. The filtrates were used to test for the presence of carbohydrates:-

a) Molisch's test:- Filtrates were treated with 2 drops of alcoholic α – naphthol solution in a test tube. Formation of the violet ring at the junction indicates the presence of carbohydrates.
b) Benedict's test: Filtrates were treated with Benedict's reagent and heated gently. Orange red precipitate indicates the presence of reducing sugars.

Test for Proteins and Free Amino Acids

Small quantity of extracts were dissolved separately in a few ml of water and treated with :

i) Million's reagent: Appearance of red colour shows the presence of protein and free amino acids.
ii) Ninhydrin reagent: Appearance of purple colour shows hydroxide and 1% solution of copper sulphate were added. Appearance of pink colour shows the presence of proteins and free amino acids.

4. Survey method, controlled and uncontrolled observation method will also used for collecting primary data while the study of available literature report analysis of various NGO's government departments, research papers, survey reports will be studied for collecting secondary data.

For the analysis, data can be computerized and large scale maps may be prepared to arrive at final conclusion and to suggest a model graph of formula.

CHAPTERIZATION :-

1. Introduction
2. Review of literature
3. Material and method
4. Physiography of Nagaur district
5. Effect of gypsum mining on Vigna radiata
6. Effect of gypsum mining on Pennisitum typhoides
7. Discussion and summary
8. Literature cited

LITERATURE CITED

- Agnihotri P., 2015 Geography, Ecology and Biodiversity Of Rajasthan, Arid And Semi-Arid Regions, UJEAS 2015 ,03(02);Page 07-10
- Abraham, L. and Szabolcs, I, Improving of alkali soils with small doses of reclamation materials. Trans. 8th Intern. Cong. Soil Sci. 2, 875–880 (1964).
- A.Shyam Kumar, K.V.Reddy, and M.Ashok.(2014)identification of variation in plant morphologythrough different methods of gypsum application in tulsi, issn2277-8616
- Bhandari S., Sheoran A.S, 1996 Environmental Impact Of Mining Activity In Rajasthan , Proc. Of Seminar On Environment Consciousness, Problems Of Pollutions And Conservation In Rajasthan, Jaipur. 1 To 3 October, 1982
- Bhandari . S., Environment And Mining In Western RajasthanBhandari . S., Bhandari A. And Arya S. 2004, Dust Resulting From Blasting In Surface Mines And Its Control, EXPLO 2004 Conference, Perth, Australia.
- Chouhan T.S., Sharma U.K., Vol IX, Desert Ecosystem In India:Tropical Biology And Conservation Management.
- Chouhan T.S., 1994 India Desert; Resources And Potential Development, National Bureau Of Soil.
- Choudhary B.S. And Sheoran A.S. 2001, Environmental Impact And Remedial Measures Of Small Scale Limestone Mines, Proc Of National Seminar On Small Scale Mining, Jodhpur. 05-06 March P.P.227-232.
- Cottard Francis, 2001, Potential Environmental Impact Of Mining 1st Workshop, 25-27 October, 2001, Viena, Austria.
- Chouhan S.S., Mining Development And Environment: A Case Study Of Bijolia, Journal Of Human Ecology, 31(1);65-72(2010)
- Chouhan S.S., 2001, Biodiversity, Bio-Piracy And Bio-Politics; The Global Perspective, Delhi, Kalinga Publication.
- Chouhan S.S., 2004, Environmental Protection And Management From Stockholm To Rio And After, Delhi, Kalinga Publication.
- Chhatwal G.R., Encyclopedia Of Ecology And Environmental Analysis, New Delhi, Anmol Publication(1977).

- Gupta R.K. And Ishwar Prakash, 1975, Environmental Analysis Of The Desert, English Book Depo, Dehradun(The Study Is Focused To Indian Thar Desert Detailing The Life Support System In Different Environmental Condition.
- Gaur C.P. And Vyas A. 2007, Sustainable Development Of Mineral Resources Of Nagaur District, Rajasthan, India, Proc National Seminar; Emerging Trends Of Research In Geology With Special Reference To North Western India MLSU, Udaipur, P.P. 191-199.
- Gupta R.K., Saxena S.K. Potential Grassland Types And Their Ecological Succession In Rajasthan Deesert.1972, Annals Of Arid Zone Vol. 11 No. ¾, P.P. 198-218.
- Lodha Praveen; Environment Impact Assessment; A Project Formation For Mining Areas. Chapter 23 P.P. 305.
- Lodha R.M. Mining And Environmental Stess: Udaipur, Himanshu Publication (1995).
- Maanju S.K., K. Saha, Impact Of Mining Industry On Environment Fabric- A Case Study Of Rajasthan In India, Journal Of Environmental Science, Toxicology And Food Technology. Vol. 6, Issu-2(Sep- 2013) P.P.8-13.
- Natani J.V., Raghav K.S.,Environmental Impact Of Marble Mininf Around Makrana, Nagaur District, Rajasthan , Vol. 62, Issue (3 Sep. 2003) (Www.Geosocindia.Org).
- Prasad B 1984, Geology;Sedimentation And Paleogeography Of The Vindhyan Super Group, South Eastern Rajasthan, GSI;Memoir P. 176.
- Report Of Department Of Minerals And Geology In Rajasthan (2014)
- Rajaram R., Chapter 3;Issues In Sustainable Mining Practices In Sustainable Mining Practices- A Global Prospective, V. Rajaram And S.Dutta, Editors 2005, A.A Balkema Publishers, A Member Of Taylor & Francis Group.
- Rajaram R. And K. Parmeswaran, Chapter; Introduction In Sustainable Mining Practices- A Global Perspective, V. Rajaram.
- Sinha Rajiv Kumar, Pandey D.K., Sinha Ambeyk. , Mining And The Environment : A Case Study From Bijolia Quarrying Site In Rajasthan. (Sept. 2000) The Environmentalist 20(3): P.P.195 -203.
- Sheoran V. Sheoran A.S. And Trivedi S.K. 2010, Socio Economic Impact Assessment Of Mining Projects In India: A Review Resources Policy (In Press).
- Sheoran A.S And Sheoran V. 1997. Some Biological Methods For Effluent Treatment In Mining And Mineral Processing Industry, Prc. Symposium On Recent Advances In Management Of Arid Ecosystem , Central Arid Zone Research Institute, Jodhpur, March 3-5.

- Sheoran V., Sheoran A.S. 2002, Eco-Friendly Technology For Sustainable Development, Proc Of National Seminar On Recent Trends In Civil Engineering Jodhpur, 22-23 Feb . P.P. 145-148.
- Sharma K.C. And Trivedi Anil.K 2009, Physio Chemical Characterstics And Fluoride Distribution In Ground Water Of Gotan Area In District Nagaur, Rajasthan , Indian Journal Of Environmental Science, (13): P.P.37-40.
- Sinha Rajiv K. 1994, Development Without Destruction, Jaipur: Environmental Publishers.
- Sengupta, Mrityunjoy 1993, Environmental Impact Of Mining: Monitoring, Restoration And Control, Boca Raton, Fl: Crc Press
- Verma S. And Sharma K.C. 2009, Air Pollution Tolerance Index Of Some Plant Species Of Ajmer, Rajasthan. Indian Journal of Environmental Science 13(2), P.P. 103-106.
- Vyas Arjun, Mittal G.S. Gaur C.P., Lignite Deposits Of The Bikaner-Nagaur Basin , Around Matasukh-Kasnau In Nagaur District Of Rajasthan, Journal Of The Geological Society Of India, Vol 86, P.P. 792-796 (2015).
- Vyas Ashutosh, Pancholi A., Environmental Degradation Due To Mining In South Rajasthan: A Case Study of Nimbahera , 2009, Journal Of Environmental Research And Development, Vol. 4 No. 2.

- Sheoran V. Sheoran A.S. And Trivedi S.K. 2010, Socio Economic Impact Assessment Of Mining Projects In India: A Review Resources Policy (In Press).
- Sheoran A.S And Sheoran V. 1997. Some Biological Methods For Effluent Treatment In Mining And Mineral Processing Industry, Prc. Symposium On Recent Advances In Management Of Arid Ecosystem , Central Arid Zone Research Institute, Jodhpur, March 3-5.
- Sheoran V., Sheoran A.S. 2002, Eco-Friendly Technology For Sustainable Development, Proc Of National Seminar On Recent Trends In Civil Engineering Jodhpur, 22-23 Feb . P.P. 145-148.
- Sharma K.C. And Trivedi Anil.K 2009, Physio Chemical Characterstics And Fluoride Distribution In Ground Water Of Gotan Area In District Nagaur, Rajasthan , Indian Journal Of Environmental Science, (13): P.P.37-40.
- Sinha Rajiv K. 1994, Development Without Destruction, Jaipur: Environmental Publishers.
- Sengupta, Mrityunjoy 1993, Environmental Impact Of Mining: Monitoring, Restoration And Control, Boca Raton, Fl: Crc Press
- Verma S. And Sharma K.C. 2009 , Air Pollution Tolerance Index Of Some Plant Species Of Ajmer, Rajasthan. Indian Journal Of Environmental Science 13(2), P.P. 103-106.
- Vyas Arjun , Mittal G.S. Gaur C.P., Lignite Deposits Of The Bikaner-Nagaur Basin , Around Matasukh-Kasnau In Nagaur District Of Rajasthan, Journal Of The Geological Society Of India, Vol 86, P.P. 792-796 (2015).
- Vyas Ashutosh, Pancholi A., Environmental Degradation Due To Mining In South Rajasthan : A Case Study of Nimbahera , 2009, Journal Of Environmental Research And Development, Vol. 4 No. 2.

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Signature of the Candidate with date

Outline Approved.

Name and Signature of supervisor with date & seal.

14.9.2016

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